



## BioSC Newsletter July 2019



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## 6<sup>th</sup> BioSC Spotlight: “Bioeconomy perspectives for a sustainable agriculture”

On 9 July 2019, the 6th BioSC Spotlight took place in Inden, on the edge of the Hambach opencast lignite mine, which was dedicated to structural change in the Rhenish mining area and the opportunities for agriculture within the framework of a sustainable bioeconomy. The approximately 80 participants came from science, business, local politics, agricultural administration, civil society, environmental associations and agricultural practice.



Photos: Forschungszentrum Jülich

Prof. Dr. Ulrich Schurr (Forschungszentrum Jülich) stated in his introduction that the solutions to the global challenges - population growth, increasing consumption and the replacement of fossil fuels by renewable resources - must be worked out regionally, since each region has different natural spaces, actors and resources. In the course of the structural change caused by the phase-out of coal, the Rhenish mining area has the opportunity to become a living lab for bioeconomy as part of a sustainable economy. The region's strengths are agriculture, which benefits from good soil and climate conditions, a strong industry and a high density of educational and research institutions, including three scientific excellence clusters and the BioSC.

In the first session "New integrated agricultural production systems", Prof. Dr. Heiner Kuhlmann (University of Bonn) presented the PhenoRob excellence cluster, which develops digital technologies for the management of agricultural land. This involves the detection of plant characteristics or the investigation of the root area, but also the development of autonomous field robots, for example for sowing or weed control. Erich Gussen (farmer and chairman of the Rheinischer Landwirtschaftsverband) then gave a lecture on the possibilities of modern plant breeding to adapt crop plants to changing climatic conditions and presented the vision of a Rhenish "food valley" based on science and agriculture. Prof. Ulrich Schwaneberg (RWTH Aachen/DWI) presented the greenRelease technology, which allows the controlled and economical release of fertilisers and pesticides over a longer period of time using biodegradable microgel containers that adhere to the plant surface with the aid of anchor peptides.

In the second session "Biorefineries as the basis for new agricultural value creation concepts", Dr. Holger

Klose (Forschungszentrum Jülich) presented various concepts for the use of alternative biomass, such as the fertilisation of biomass plants with fermentation residues from biogas plants, the use of lignin from solubilised vegetable biomass as a starting substance for high-quality chemicals and materials and the recovery of phosphate and nitrate from wastewater with the aid of algae. Dr. Jörn Viell (RWTH Aachen) presented the NGP<sup>2</sup> biorefinery, which makes it possible to test and further develop new research methods on a pilot scale and thus bridge the gap between research and commercialisation. Andreas Dering (farmer and managing director of the Maschinenring e.V.) reported on the numerous projects of the agricultural association Maschinenring e.V., such as the construction and operation of biogas plants in Baesweiler and Ameln or the development of a tracking software for agricultural vehicles.

In the third session "Regional implementation and value creation potentials" Prof. Dr. Ralf Pude (University of Bonn) informed about the ecological advantages of the cultivation of perennial plants such as *Miscanthus* or *Silphium* in agricultural hem areas. He presented impressive examples of the use of these plants, such as the production of lightweight concrete or peat substitutes. Prof. Dr. Stefanie Bröring (University of Bonn) described the massively changing industry logic in the agricultural sector, in particular the progressive integration of the IT and agrifood sectors, and discussed the options and risks that arise for start-ups and small and medium-sized enterprises. Heiko Thomas from the Ministry of the Environment, Agriculture, Nature and Consumer Protection of NRW presented the "Platform for Food and Agriculture, Innovation and Sustainability in the Rhenish mining area (PLAIN-RR)", which will initiate and support processes and projects for the (further) development of the region. PLAIN-RR involves numerous stakeholders, from associations such as the Rheinischer Landwirtschaftsverband to universities and research institutions to various state and federal ministries.

In the lively discussions at the end of the sessions, it was repeatedly discussed that agriculture is already making a major contribution to value creation in the Rhenish mining area and that a discussion on current social ideas and demands on agriculture is urgently needed. Ecology and biodiversity were seen as central topics, as were digitalisation and new value creation models. The participants, who came from such diverse fields as science, (agricultural) economy, politics, administration and civil society, used the event intensively to network.

More information: [www.biorevier.de](http://www.biorevier.de)

## **Competence Platform Transform2Bio - Integrated Transformation Processes and Their Regional Implementations: Structural Change from Fossil Economy to Bioeconomy**



**Ensuring the well-being of current and future generations without transgressing environmental limits is an overarching objective of the concept of the sustainable bioeconomy. Achieving this objective will require major transformations of existing resource systems, value networks, business models, infrastructures and governance systems. The recent decision of the German government to phase-out coal mining will initiate major transition processes in the lignite mining region, the Rheinische Revier, creating a unique opportunity for understanding the socio-technical dynamics and implementation options towards an entire sustainable bioeconomy region.**

Against this background, Transform2Bio aims to systematically identify transformation trajectories for the implementation of a bioeconomy in the Rheinische Revier. These transformation routes need to be, at the same time, (a) desirable (from a sustainability perspective), (b) feasible (from a techno-economic perspective), and (c) acceptable (from a stakeholder consensus perspective). Pooling expertise from (agricultural) economics, operations and innovation management, entrepreneurship, political science, economic development, consumer psychology and socio-technical systems analysis, the research approach of Transform2Bio follows the inter- and transdisciplinary sustainability research agenda

integrating orientation, system, and transformation knowledge. As part of this multi-dimensional approach, Transform2Bio will establish an interactive stakeholder network, the Stakes2Bio Lab. It will provide the room both for continuous stakeholder dialogue ('society to science') and the establishment of regional 'science to society' networks. These will provide bioeconomy implementation options based on cutting-edge scientific research which can be readily tested against 'real world' stakeholder settings. In this regard, Transform2Bio also provides the crucial basis for the BioSC FocusLabs to readily reflect their concepts and potential products against 'real stakeholder responses' and with respect to their complementarity with expected transformation trajectories.

### **What is the relevance for bioeconomy?**

The widespread implementation of the bioeconomy will be strongly driven by the introduction of both biobased substitute and novel products and production processes (including those developed in the FocusLabs). However, this transformation will likely implicate also radical technological innovations, which may disrupt existent business models and entire industry logics, as well as innovations in social processes, governance processes, and individual decision-making. Considering such stakeholder dynamics, their underlying motivations as well as their effects, the impending, large-scale structural change process in the Rheinische Revier provides a unique opportunity for developing options to implement important structural and institutional foundations within a regionalization approach towards a sustainable bioeconomy in an entire region. The project is funded over a period of three years.

**Project leader:** Dr. Sandra Venghaus, Institute for Energy and Climate Research, Department Systems Analysis and Technology Evaluation (IEK-STE), Forschungszentrum Jülich

### **Partners:**

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Prof. Dr. Ulrich Schurr, IBG-2 – Plant Sciences, Forschungszentrum Jülich

## **Dr. Sandra Venghaus | Forschungszentrum Jülich | IEK-STE - Systems Analysis and Technology Evaluation**

Sandra Venghaus received her Bachelor of Arts degree in Environmental Science and Public Policy from Harvard University in 2004. After a two-year scholarship in the DFG Research Training Group "Interdisciplinary Environmental History" at the University of Göttingen, she began her doctoral thesis on "The Management of Complex System Innovations" at the Institute for Marketing and Management at the University of Hanover, where she received her doctorate in 2011. From 2009 to 2014, she worked as a research assistant at the Potsdam Institute for Climate Impact Research and the Institute for Innovation and Technology Management at Bielefeld University. In 2014 Sandra Venghaus joined the Institute for Energy and Climate Research at Forschungszentrum Jülich, where she established her own research group in the department "Systems Analysis and Technology Evaluation".

Her research focuses on discourses, decision-making mechanisms and power constellations in complex social processes such as the energy system transformation in Germany. In addition, she researches the modelling of socio-ecological systems and the consequences of political decisions for sustainable development. Another research topic is the "water-energy-food nexus". This term was introduced by the FAO and encompasses the dependencies between energy, water and food supply.

Sandra Venghaus heads the BioSC competence platform "Transform2Bio", which will be launched on 1 September 2019.

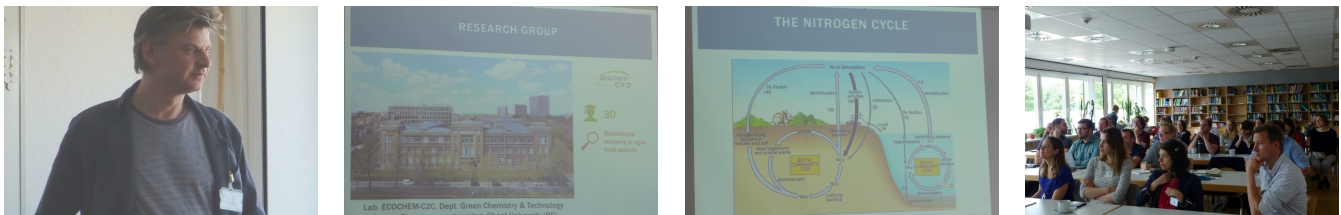


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## The 21<sup>st</sup> BioSC Lecture: “Cradle to Cradle: Upcycling bioresources for the new circular bioeconomy”

On 11 June 2019, the 21st BioSC Lecture took place at Forschungszentrum Jülich. Prof. Dr. Erik Meers from the University of Ghent presented three European clusters working at different levels to make the transition from linear to circular value creation possible. In particular, he addressed the nitrogen cycle and the use and recovery of nitrogen in agriculture.



Photos: Forschungszentrum Jülich

The [BioRefine Cluster Europe](#), founded in 2013, networks 21 research projects working on the valorisation of residual flows from agriculture, the agro- and food industry as well as biological waste and waste water. The common goal is that residual and waste flows will no longer pollute the environment but be used as secondary resources. The cluster supports the implementation of the results in practice. Furthermore, the University of Ghent has founded the business development platform "[End-of-waste](#)" to initiate collaborations between academia and industry, as well as the scientific network [INFINITY](#), which, for example, offers training modules for doctoral students on the subject of nutrient recycling.

Erik Meers focused in particular on the problem of the shifted global nitrogen cycle. Since the middle of the 20th century, both the use of mineral fertilizers and the combustion of fossil fuels have risen sharply. Both of these factors cause nitrate to be increasingly introduced into the soil and to accumulate through leaching in groundwater, inland waters and finally in the sea, where algae carpets are formed and oxygen deficiency results. He presented some projects from the Biorefine Cluster that address this problem. The [SYSTEMIC project](#) is developing new biorefinery systems that make it possible not only to produce biogas from liquid manure, sewage sludge and food residues, but also to recover phosphate and nitrate from the fermentation residues. In the [ALG-AD project](#), fermentation residues from biogas plants are used as a substrate for algae that produce proteins and lipids that can be used for animal feed, for example. The [Nutri2Cycle project](#) investigates nitrogen, phosphorus and carbon fluxes and the associated environmental problems in farms throughout Europe that use various farming techniques in order to derive recommendations on how nutrient cycles can be closed more efficiently in the future.



## Open Day at Forschungszentrum Jülich: High interest in the bioeconomy

On 7 July 2019, the Open Day took place at Forschungszentrum Jülich with around 23,000 visitors. There was great interest in the BioSC exhibition "Products of the Bioeconomy", which presented a variety of bio-based products that are already produced today. The Bioeconomy Trail, which covered the entire site, also attracted numerous visitors.



The Bioeconomy Trail, which the Jülich BioSC Core Groups had designed, illustrated the concept of a sustainable circular economy. While IBG-3 (Agrosphere) showed concepts for an environment- and resource-saving use of soil and water, IBG-2 (Plant Sciences) addressed sustainable plant production. The institutes IBG-1 (biotechnology), IMET (enzyme technology) and IBOC (biorganic chemistry) provided information on the basics of the biotechnological production of materials and chemicals from biomass. At the Department of Environmental Services, the wastewater treatment plant of the Research Centre could be visited, where methods for the recovery of nutrients from wastewater are being established in cooperation with the IBG-2.

The BioSC exhibition "Products of the Bioeconomy" presented a variety of bio-based products which are already produced today and most of which are also available. In addition to well-known examples such as detergents with biosurfactants, these included a laptop case made of pressed hemp, a functional T-shirt made of wood fibres and shoes made of pineapple leaf fibres. Colourful balls of corn granulate, which after moistening could be used like dough, met with great approval among the children and turned into numerous small works of art. Products made from the raw material grass were also shown. The exhibition featured paper and packaging materials with a grass fibre content of around two thirds, as well as terrace planks made of a plastic that is made from ensiled and ground grass. Prototypes of composite materials made from plant fibres and bioplastics, such as the interior trim for a car door, showed impressive possibilities for the future. The diverse product range showed that bioeconomics is possible and already present in everyday life and brought the topic closer to a broad public.

